in shock after trauma or pulmonary embolization. Biochemical assays indicated that cardiopulmonary function and tissue oxygenation were maintained when OHP was used after pulmonary embolization.

The value of hyperbaric oxygen in treatment of septic shock was less dramatic. Six hours after inoculation of the peritoneal cavity of 10 dogs with fresh suspensions of feces, nine of the 10 died in spite of OHP. In a second group of animals the peritoneal cavity was vented to permit equilibration of the oxygen at the high chamber pressure with the peritoneal cavity. This modified method increased the duration of survival time but not the number of survivors (Chart 4). However, the blood stream in these dogs was cleared of bacteria within one to four hours. In all other groups the bacterial content of the blood stream progressively increased until death. *In vitro* Staphylococci, Escherischia coli and Pseudomonas were greatly inhibited by OHP, suggesting that bacterial growth is effectively curbed if oxygen tensions are sufficiently high at the site of infection.

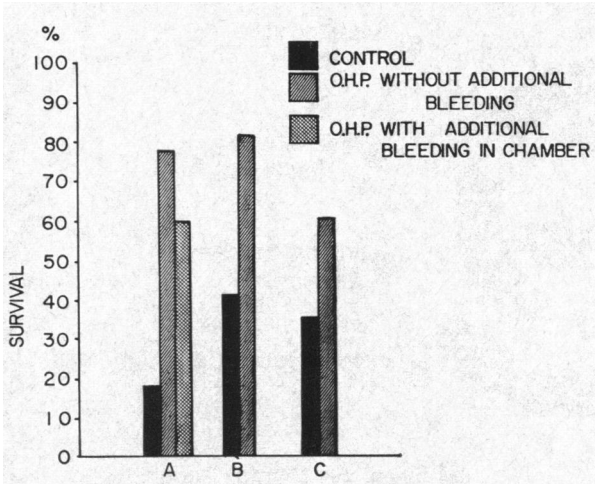

Chart 3.—Effect of hyperbaric oxygenation (O.H.P.) on survival: (a) hemorrhagic shock, (b) traumatic shock, (c) pulmonary embolism.

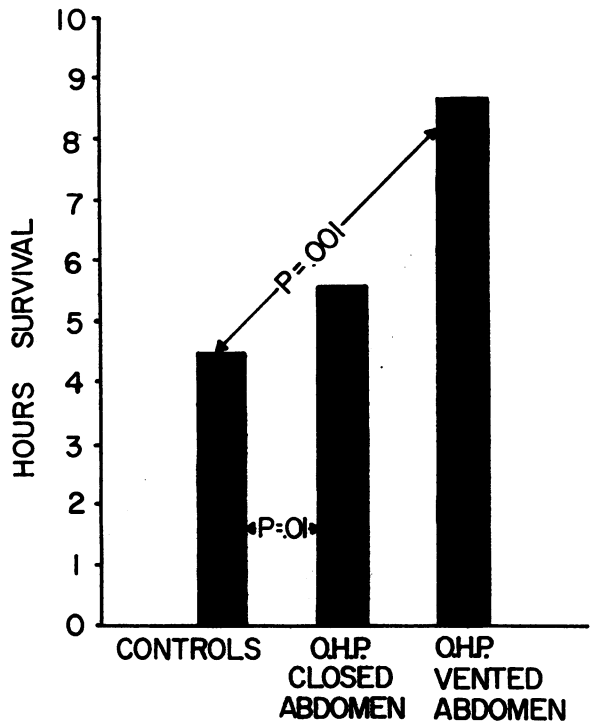

Chart 4.—Survival of animals with septic shock (fecal peritonitis) when treated with hyperbaric oxygenation (O.H.P.).

Results With Phentolamine (Regitine®) In the Treatment of Selected Patients With Shock

EDWARD C. BRADLEY, M.D.*

In dogs, phentolamine (Regitine®) consistently increased venous return while it lowered arterial pressure and peripheral resistance. It appeared likely that this drug had promise for increasing venous return and cardiac output in patients with shock. A total of 37 observations were made on 13 patients with clinical features of shock. Shock was related to bacterial infection in six, fluid loss in two, to a cardiac cause in three and to neurological injury in two. Phentolamine was infused intravenously at an average rate of 0.6 mg per minute for an average duration of 22 minutes. In each trial, cardiac output increased during infusion of phentolamine. With Regitine® alone, cardiac index increased from an average of 2.8 to 3.6 L/min/M² (liters per minute per square meter of body surface) on 15 trials in eight patients ($p < 0.001$), and arterial pressure declined from a mean of 73 to 59 mm of mercury ($p < 0.001$). When phentolamine was administered on 22 occasions to five patients in whom arterial pressure had been maintained at low "normal" values by a constant infusion of metaraminol, cardiac index (Chart 5) increased from 2.1 to 3.4 L/min/M² ($p < 0.001$). Improvement in systemic blood flow was mani-

*Instructor in Medicine, University of Southern California School of Medicine.

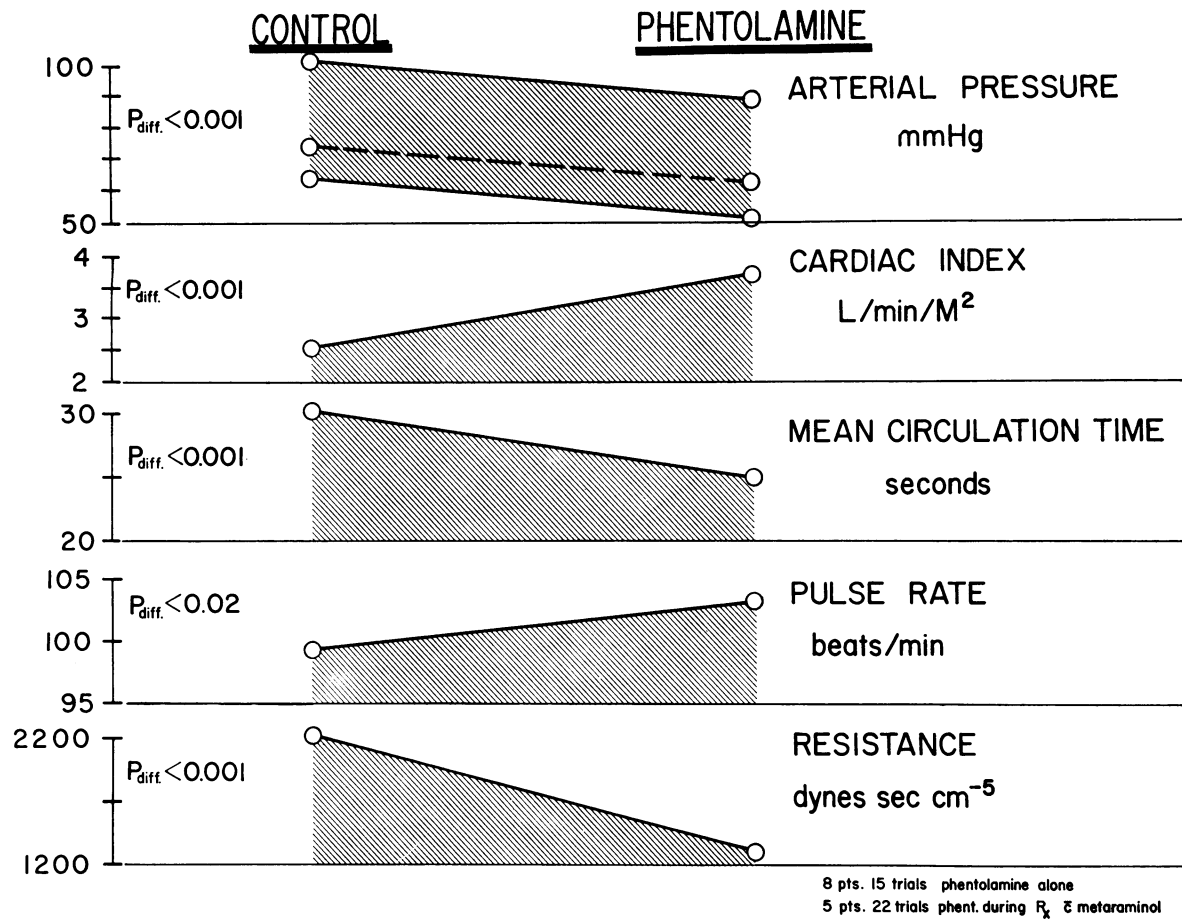

Chart 5.—Hemodynamic effects of phentolamine in patients with circulatory shock. The mean values for 13 patients are shown.

fested by a reduction in mean circulation time, an increase in peripheral skin temperature and an increase in urine flow.

We conclude that in selected instances an adrenolytic drug may be used in conjunction with, or in preference to, a pressor amine to improve effective blood flow in circulatory shock.

Guiding Volume Repletion in Patients In Shock by Observation of Central Venous Pressure

F. LAIRD FACEY, M.D.*

In guiding fluid repletion in patients in clinical shock, central venous pressure is the single, most useful measurement currently available. Since peripheral venous pressures may be falsely high or low in comparison to central venous pressure, care must be taken to assure that the tip of the catheter used for measurement is in a central vein in the thorax, preferably in the right atrium. The early detection of myocardial decompensation, manifested by a persistent increase in central venous pressure to levels exceeding 15 cm of water, is its principal value. Cardiac overloading is prevented during infusion of fluids by avoiding persistent increases in venous pressure exceeding 5 cm of water.

Central venous pressure is not in itself an index of blood volume. In patients who have lost blood or other fluids, the effects of infusions on central venous pressure are variable. Since central venous pressure reflects the relationship between the volume of blood presented to the heart and the competence of the heart, an increase is due either to overloading with fluid or limited competence of the heart as a pump.

Seven patients with acute circulatory insuffi-

*Instructor in Surgery, University of Southern California School of Medicine.